

**CLAIMS**

**WHAT IS CLAIMED IS:**

1. An optical switch expanding method for increasing the number of inputs and outputs of an optical switch comprising first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, comprising the steps of:

respectively connecting said auxiliary output ports in the first optical matrix switch to said input ports in the third optical matrix switch;

10 respectively connecting said output ports in the second optical matrix switch to said auxiliary input ports in the third optical matrix switch;

respectively connecting said output ports in the first optical matrix switch to said auxiliary input ports in the fourth optical matrix switch; and

15 respectively connecting said auxiliary output ports in the second optical matrix switch to said input ports in the fourth optical matrix switch.

2. An optical switch comprising first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, and wherein:

20 said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch;

25 said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch;

29 said output ports in the first optical matrix switch are respectively connected to said

auxiliary input ports in the fourth optical matrix switch; and

said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch.

3. The optical switch according to claim 2, wherein the first to fourth optical matrix switches are Cross-bar optical matrix switches.

5 4. The optical switch according to claim 2, wherein said 2-input/2-output optical  
switch elements are semiconductor optical switches.

5. The optical switch according to claim 2, wherein said 2-input/2-output optical switch elements are optical switches in an opto-micro-electromechanical system.

6. The optical switch according to claim 2, wherein the first to fourth optical matrix switches are PI-LOSS optical matrix switches.

7. An optical crossconnecting apparatus comprising:

a plurality of optical demultiplexing means for demultiplexing, on a wavelength basis, input light so as to be output from a plurality of output ports;

a plurality of optical multiplexing means for wavelength-multiplexing light which have been input to a plurality of input ports; and

an optical switch, and wherein:

said optical switch comprises first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports,

said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch;

said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch;

25 said output ports in the first optical matrix switch are respectively connected to said

**auxiliary input ports in the fourth optical matrix switch;**

**said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch;**

**said input ports in said optical switches are connected to a plurality of output ports in**

**5 said optical demultiplexing means; and**

**said output ports in said optical switches are connected to a plurality of input ports in  
said optical multiplexing means.**